UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

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SOME AGRICULTURAL MIGRATIONS

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Address, Convention of the North and South Carolina Cottonseed Crushers' Associations, Myrtle Beach, S. C., June 17, 1940

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Mr. President, and

Gentlemen of the North and South Carolina Cottonseed Crushers' Associations

Heretofore, when it has been my pleasure to be with you, I have spoken chiefly on the subject of cottonseed marketing, but today I have chosen as my theme - Some Agricultural Migrations.

I am thinking of this subject as referring to migrations of crops and agricultural industries rather than to migrations of agricultural peoples.

Crop migrations, of course, have their effect on, and frequently are followed by migrations of the agriculturalists dependent upon those crops. They also sometimes cause violent repercussions in the industries that have been developed for processing the crops and if not anticipated and followed by industrial migrations coordinated with the crop migrations, sometimes result in disaster to those industries.

A large number of factors have contributed to the rapid migrations of crops in the United States. Of first importance was the expansion of agriculture westward - the finding of new lands more adapted to a particular crop. Concomitant with this western expansion of agriculture came the development of railroads and other forms of transportation for transporting crops to centers of consumption. Following this were the discoveries of methods of sterilization and refrigeration and their application to prevent spoilage in transit, so that today lettuce growers in the Imperial Valley of California can compete with locally grown lettuce on the Boston market. And all of us, wherever located, regardless of the time of year, can enjoy the fruits of the soil that we formerly got along without because "it was out of season." In some instances, particularly in the Northeastern portion of the United States, the gradual shrinking of agriculture has been offset by industrial expansion.

The shifting in the past of the centers of production of the various crops is of interest if we can learn of the mistakes of readjustments that have been made and anticipate future shifts and be prepared for them.

In the early days the center of the dairy industry was in the New England States, but it has gradually shifted, first to New York, then Ohio, until now it is in Wisconsin and Minnesota.

In 1840 the center of hog production was in Kentucky. The center shifted first to Ohio and Indiana; by 1880 it was in Iowa - Illinois, and by 1920 the largest hog population was in Iowa and contiguous parts of Nebraska and Illinois.

The migration of the center of production of wheat is of interest. In 1900 it was in the Dakotas and Minnesota. In 1910 there were two principal centers: one in North Dakota, and the other, Kansas - Nebraska; but by 1920 the chief center of wheat production was Kansas and northern Oklahoma.

We are prone to think of Texas as the great cattle country, but in 1880 the center of cattle production was Iowa and parts of Missouri and Illinois. Although in 1900 the center had drifted toward Texas; by 1920 it had backed up again into Iowa.

One of the most marked shifts in an agricultural industry was that of cotton spinning. Almost a New England monopoly for several generations, cotton spinning was gradually shifted into the Carolinas, chiefly because of labor conditions. Then came the development of control of humidity and of temperature, which permitted spinning mills to be located even in hot, dry climates and even in the deserts. So today spinning mills are located clear across the continent and who can tell where the center of the industry will be 25 years from now. The drying up of the spinning industry in the New England States has wrought severe hardships in many instances. Mill after mill has become insolvent. Only a few months ago what is said to have been the largest cotton spinning mill in the world - Amoskeag became bankrupt and closed, with the result that thousands upon thousands of mill workers became idle.

The center of cotton production has also shifted, partly because of the extension westward into new lands, but aggravated by the drying up of production in the East due to boll-weevil activity, crop control, and to the discovery by the producers that the substitute crops that they had turned to with the advent of the weevil, were sometimes less laborious to handle and frequently were more remunerative than cotton. Not all migrations of the centers of production of a crop are the results primarily of any diminution of production in the original center, but rather the result of increased production on more favorable lands, under more favorable climatic conditions or possibly under more favorable labor conditions.

In many cases the shift of the center of production of a crop is the result of finding more suitable growing conditions which has resulted in such an unfavorable competitive situation as to cause the abandonment of the crops in the original and less favored situations. This appears to be the case with cotton culture in the Carolinas. Twenty years ago not a single bale of cotton was produced in the great plains of the Pan Handle of Texas. In 1937 Lubbock County alone produced 172,000 bales and those so-called great semi-arid plains produced in the season of 1937 above 850,000 bales of cotton. In 1920 California and Arizona together produced only 173,000 bales, but in 1937 their combined production was 1,051,600 bales.

Let us for a moment consider this shift in cotton production as it has affected conditions in the Carolinas.

During the 10-year period ended with the season of 1920 the two Carolinas produced an average of about 2,266,000 bales of cotton, but during the 10 years ended 1938 the Carolinas together produced an average of only about 1,490,000 bales, a drop of 34 percent.

In 1920 South Carolina ranked second and North Carolina sixth in cotton production. In 1938 South Carolina was seventh and North Carolina eleventh.

In 1920 there were 5,485 active gins in the Carolinas, but in 1938 there were only 2,481 active gins in these two States - a loss of 3,003 cotton gins; but the general average ginning rose from 413 to 600 bales per gin.

Now let us look at the cottonseed situation. During the 10 years ended 1920, the cottonseed mills in these two States crushed an annual average of approximately 687,500 tons of seed, compared with an average annual crush during the 10 years ended 1938 of approximately 470,500 tons. This was a reduction of 31 percent.

In 1920 there were 139 active oil mills here in the Carolinas and in 1938 this had fallen to 63 active mills. The average crush during the early period was 4,946 tons per mill, which rose to 7,978 tons per mill in 1937. This would at first blush appear as an improvement in the situation; however, the fly in the ointment is that presses are not made of babbitt metal and seldom wear out; moreover they have so little scrap value, that they are seldom scrapped. Therefore, if the reduction in the number of mills simply represents a consolidation without change in the number of presses then, in the early period the mills averaged about 1,590 tons per press against 1,090 tons per press during the last period, or a reduction of 500 tons per press. The average for the season of 1938-39 was only 802 tons per press.

Studies made by your own National Association some years ago indicated that with present-day facilities and demands for efficiency of operation, the crushing of not less than 1,600 to 2,000 tons per press is necessary to give fair economic returns.

But first let us look at the mill situation from a purely mill unit standpoint, taking the average of the 5-year period 1934-35 to 1938-39, and comparing the crushings by the mills located in the several States.

During these 5 years in North Carolina an average of 5.8 percent of the mills crushed less than 1,000 tons, 21.8 percent less than 2,000 tons, and 49.7 percent of the mills less than 5,000 tons.

In South Carolina 7.7 percent of the mills crushed less than 1,000 tons, 13.5 percent less than 2,000 tons, and 42.3 percent less than 5,000 tons.

Data are not available to determine whether the mills in these various categories were one-, two-, three-, four-, or more press mills; but I take it, that if any of the mills reporting a crush annually of less than 2,000 tons are equipped with more than one press, inefficiency, uneconomic operation, and financial distress, increase almost as the square of the number of presses. It can be appreciated therefore that in some localities and under some circumstances, a one-press mill might be more economical of operation than mills with greater capacity.

At 15 tons of seed per press there was work for only 72.3 days in the Carolinas. The average crush of the United States at 15 tons per day per press furnishes work for only 96.8 days, and in an emergency at 20 tons per press the entire crush would be over in 72.6 days.

There is no gainsaying the fact that when large investments stand idle 75 percent of the time each year, they simply eat their heands off, to use a common expression. The costs of such idle time must be reflected in the price paid for the raw material, in the returns paid for labor, or in neglect of equipment. The presumption is frequently made that these costs are all absorbed in the price paid for the raw material, either directly and generally or indirectly through the losses to stockholders in bankruptcy proceedings. Therefore the whole present set-up of the cottonseed-crushing industry is uneconomical and wasteful.

Therefore, if it were possible to clear the deck and start all over again with modern mills running an average of either 150 or 200 days per annum, then in the Virginia-Carolina competitive territory 222 presses working 150 days, or 166 presses working 200 days a season at 15 tons per press per day, would handle the average crop compared with the present emplacement of 413 presses working an average of 72 days.

I regret to say that I am not very sanguine that the recent efforts that have been made in the Carolinas to persuade farmers to plant at least their full quotas of acres to cotton will materially increase the crop. I fear that many of the mills, not only in the Carolinas but possibly elsewhere in the Southeast, are bolstered with the forlorn hope that some miracle may occur either to push the price of cotton so high that farmers will plant as many acres to cotton as they did before the boll weevil turned them to other crops, or, what amounts to the same thing, that the substitute crops will not continue to be more remunerative than cotton. Farmers in many sections of the old Cotton Belt, in my opinion, have turned definitely away from cotton as a sole and only crop.

I am simply offering these ideas for your earnest consideration should any of you, or any other person with less experience than yourselves, at any time feel the urge to build a new oil mill, either individually, or collectively as a cooperative. Let us face the fact that agricultural crop migrations do take place, that cotton culture has migrated, and that industries dependent upon migrating crops must also migrate, readjust themselves to other crops, or face financial distress.

I think that there is another very important phase of cottonseed crushing that cannot be studied too much, especially by the smaller units of the industry. I say by the smaller units, for I believe that the larger units are already giving serious attention to the subject. I refer to the variations in the composition of cottonseed that affect milling. Since there are still some who deny that there is any variation in the composition of cottonseed, and particularly those who are surprised and incredulous of the accuracy of sampling and chemical analysis when two or more lots of seed taken from the same seed house are reported as of different grades, I would like to take a few moments to point out to you a few facts as to the ancestry and family history, as it were, of those cottonseed that to the long-accustomed but nondiscriminatory eye look so much alike.

Did you ever stop to think what those little kernels that you separate from the hulls, then roll, cook, and press, are, in the life history of the cotton plant? If you will take a cottonseed kernel and let it soak in warm water for awhile, it will swell up and unfold and you will find that it is composed of two, sort of thick, fat leaves attached to a tiny plant or germ. When cottonseed are planted this little germ plant grows out into the ground, and pushes these two leaves up through the

ground still protected by the seed coat. The seed coat soon drops off and the two leaves unfurl and form the seed leaves or cotyledonary leaves.

You have seen these first two leaves gradually dry up, and as soon as true leaves come out, these leaves or cotyledons fall off. What has happened is this. The little germ plant has fed on the oil, the protein, and the sugars, that were stored in the cotyledons, while it was growing its roots and becoming a self-supporting individual. You see, that up to this time the seedling plant has been supported by contributions received from its mother plant.

Now just before these two first leaves drop off, if you would soak them in some warm water they would swell up and you would find a matrix or spongy mass which is composed of cellulose, the fiber in your cake.

You noted that I said that there were three principal things that the seedling plant drew out of the cotyledons as its food - oil, protein, and sugar. These really should have been named in a different order if we would state them in the order of their development in the mother plant. In the mother plant, the sugars, generally called carbohydrates, are the first to be formed. Carbohydrates are formed through a process known as photosynthesis. Photosynthesis works through a vegetable catalyst called chlorophyl. Some of the sugars are later compounded with nitrogen and other things to form proteins. Some form the fibrous, spongy cellulose matrix that holds the germ plant and cotyledons together. Some are acted upon by another catalyst, generally called an enzyme, and converted into oil. And some just remain as sugars. How much remain as sugars varies under different conditions of growth, just as do the amounts that are converted into oil, or compounded into proteins vary under different conditions of growth. For instance, the enzymes that convert the carbohydrates into oil are apparently affected directly by the moisture content of the seed, which of course affects the density of the plant juices in which the enzymes act. Enzymes seem to be fussy about the density of the medium in which they act. If this medium, the plant juices, is too thick, as would be the case during drought, or if the particular soil on which the mother plant is growing dries out quickly, then less oil is formed. Similarly, if the density or specific gravity of the plant juices is too low or too thin, as might be the case when excessive rains fall, the enzymic conversion of carbohydrates into oil is retarded.

The compounding of the carbohydrates into protein seems to be influenced chiefly by the amount and possibly the intensity of sunshine. So that wherever and whenever cloudy weather prevails, less protein is generally compounded than where clear, sunshiny weather prevails.

Let us take a 25-ton lot of seed. It is composed of the seed from about 50 bales of cotton, we will say. These 50 bales were probably grown on 100 acres and the 100 acres might have contained 80 different kinds of soil. Well, we won't multiply this much further, except to say that the 100 acres probably contained about one-half million plants and the number of bolls runs into the millions. Some of these plants stood on good land, some on stony land, and some on land that should have been reserved for roadsides; some on land infected with wilt or root rot. Some of these millions of bolls were probably injured by boll weevils, worms, or other insects, some by anthracnose or other diseases, some ripened normally, and some anything but normally.

I think you are now about ready to appreciate that those seed that look so much alike are anything but alike when we get inside of them and find out how much and what quality of oil they contain and also how much protein is in them. Remember, that you cannot get out any more oil or protein than nature, assisted or embarrassed by men, has put in the seed.

And I think you are also ready to believe that the seed in a gin house, instead of being alike are probably not only badly layered with seed of different qualities, but that each layer is a bad mixture.

The thing that surprises me most these days, is to hear a mill manager express surprise and disbelief when two or more deliveries of seed, made from the same seed house, are analyzed and found to be of different grades. From the above brief discussion I believe you will now agree with me that the greatest surprise would be to find two lots out of a seed house that were of identical grade.

I know that it is frequently objected that chemists are not infallible, and that it is not possible to take two samples out of a lot and have them grade alike; whereas the truth is that if we draw two <u>representative</u> samples, they will grade alike. When we can take 100 pounds of cottonseed and mix it, break it up into 40 or 50 parts, send one part to each of 40 or 50 chemists, and have them analyze them, and have those analyses check within .2 of one percent on oil, within .05 of one percent on NH_3, within 0.2 of one percent on F.F.A., then I say that we can and do take a representative sample and that chemists do secure concordant results. In order to check the work of every chemist that we license, we send out such a divided sample at frequent intervals during each season, and under our regulations, a chemist, to secure a license and to retain a license to analyze and certificate the grade of cottonseed, must make a rating of not less than 90 in the accuracy of his work.

All of this discussion of the migration of the cotton crop, of the oil-mill emplacements, and of the expected variations in the composition is leading to the fact that for the benefit of all, and particularly of the so-called small or local mill, cottonseed should be marketed on the basis of grade. At present, local mills are simply trying to outwit the stronger mills with their facilities for ascertaining the locali of the cream of the crop, for offsetting temporary losses, and for leaving the less desirable seed for the weaker units.

Let us realize, before it is too late, that with the present limited supply of seed, with no imminent prospect of any material increase in seed production, coupled with the oversupply of presses, that the present laissez-faire method of marketing cottonseed means only one thing and that is that the weaker units will gradually become weaker until they are crowded off the map, and that the only salvation for the smaller units is for them to become equal in the market through the purchasing of their raw material, cottonseed, on the basis of grade, with the same basis grade price for all, whether large or small.

Then let us hope that those units which are able will realize that they are in a position to migrate with the crop, and so move on, thus leaving the residue of seed left over after the regression of the crop to those mills which were developed by local interests and which, because of their local attachments to the very soil in which they stand, are unable to migrate.

In closing I would like to read a few extracts from a letter written by one whom I consider to be one of the most philosophical thinkers in the oil mill industry today. He wrote "Several trends have become apparent in America. These appear to be definite changes from old patterns of business conduct. There has been a growing realization that business and democracy are bound together. Business grew to its greatest extent under a philosophy of free competition. It will continue strong only in an atmosphere of free competition with no grasping special privileges.

"During the period of geographical expansion capital was encouraged out of all proportion according to present standards because the need was for capital. Today we know more keenly that capital cannot be weighed abainst all other elements in the situation without creating a disproportionate, unjust and unfair circumstance.

"Capital has a way of destroying itself in time. Money invested in stage coach lines depreciated rapidly with the advent of the railroad and you and I have witnessed the depreciation in railroad securities since the motor car and the airplane became competitors.

"The same problem of evolution has taken place in all phases of business continuously. I think it has been much slower in the oil mill business than any other industry with which I am acquainted. There are visible signs of this change today. We are moving whether we like it or not. The important thing is, are we moving forward."